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GOLD MINING IN IDAHO.

BY PROF. F. A. RAY.

Gentlemen of the Institute :

What I have to say will be a general talk on a few points of interest that I observed while in the State of Idaho last fall. I wish to speak of water irrigation as one point, and I wish to speak also on a few points of interest that I observed connected with the mines in the region of Boisé City. You that have been over the Union Pacific know that the railroad passes through the great Snake river desert. It parallels the Great Snake river, and the country is a barren desert. The dust and the scenery are something fearfully oppressive. The car windows are closed as tight as can be, and still everything in the car, before a day's journey is passed, is perfectly white. Your eyes and nose are sore and you feel generally disagreeable, and you will wonder of what earthly use all that great expanse of country is.

The last stopping point before you enter this region is a town of considerable size and located on an Indian reservation. From there on there is nothing whatever to be seen except here and there a station and a green spot where they have managed to get some water onto the ground, and these sights are very refreshing. But the general impression you get of the State is that it is utterly worthless. There is plenty of sunshine and color in the sky, and that is about all you can say. We reached Nampa, at which point we took the northward branch of the Union Pacific to Boisé City, the capital. From Nampa we began to see evidences of civilization, corn fields, etc., and having seen so much of desert, this looked really like entering a Garden of Eden. This vegetation increased in luxuriansness as we got near to Boisé City, and there it was a garden indeed. We could see large tracts of land set out in fruit trees, with branches loaded down with the fruit, which was nearly ripe at that time. On reaching Boisé City we found streams of water running though the streets that looked so refreshing one felt like stooping down and drinking from them for the purpose of trying to get rid of the dust that seemed to be cutting your entire length. Irrigation for this city is gotten by going up several miles on Boisé river and damming it, and a canal at the

proper grade, conveys the water to the city. That would be a very large canal, and from that smaller ones run out over the territory to be irrigated.

The point I wish to speak of is one which was entirely new to me and very interesting. The penitentiary there is a new institution, having been developed within the last few years. They have drilled wells and struck a strong flow of hot water, so hot, I was told, that eggs could be boiled in the water. This water was conveyed to a reservoir and allowed to cool, and from the reservoir was led upon the grounds, being used to irrigate a very fine garden attended to by prisoners, from which they get the greater portion of their living supplies. They employ the prisoners in this way, all the improvements on the grounds and the like being done by prisoners. They teach them the trades in this way. Another use they made of this water from the wells was for heating a number of buildings, which they did very successfully.

The town, I suppose, would not exceed in population five thousand; but it is a very pretty town, with trees, flowers and lawns—almost tropical in its beauty.

In this city they also have a natatorium, the first of the kind I had ever seen, which is also supplied from these wells. The swimming pool they had there is about one hundred by one hundred and sixty feet in size filled with water as clear as crystal and of about blood temperature, I should judge. The depth of the pool was four feet at one end, sloping to fourteen, with a nice cement bottom. The building is beautiful architecturally, the whole establishment having cost about sixty thousand dollars. It is one of the sights of the capital of Idaho.

You perhaps remember that Idaho took the highest medal for fruit at the World's Fair. This is one of the principal resources of the State and is one of the products in which she can excel nearly any other of the states. Prunes are one of the most profitable fruits to raise, the climate and everything pertaining to it seems to be especially adapted for prunes and fruit of that class. We were told that a thousand dollars an acre was not an uncommon yield or profit from land devoted to prune culture. One of the drawbacks of this State is the fact that large companies, who expected to make large returns on their investment, had taken up great tracts of land and constructed large ditches, charging exorbitant rates for water. Men had also taken up more land than they could attend to with the hope and expectation that it would enhance in value, and would only cultivate a portion of it, holding the rest for rise in price. Since then the Arid Land Act has been enacted, whereby it is possible for a company to irrigate large

tracts of land and make the water rights a part of the deed to the land at a reasonable rate. I know of no State where the advantages and possibilities of making handsome returns in reclaiming land are as good as in this Great Snake river desert. The land is very fertile and all it lacks is water. There is a project now on foot out there, I am told, of damming the Great Snake river, which you will remember is a tributary of Columbian river. It is proposed to build a fifty foot dam, and erect something like four townships, possibly more, the dam being made so high that the water would flow around the foot hills and irrigate all below it. Large canals would be run along the foot hills at sufficient height to give water enough and from that lateral ditches of lesser size would be run across through the country. From these smaller ditches would be run, on down to the stream between the rows of corn, until the whole territory is properly irrigated.

It was quite a fascinating subject to me and an entirely new one. It is interesting to see what it is possible to do with a country which seemed utterly worthless. Various devices are resorted to by the farmers for getting water upon the ground higher than that where the ditches run. One of these was like an old time mill, on each blade of the wheel a bucket being fastened. The wheel would be in this shape (indicating) with radiating spokes like the stern wheel of a steamboat and set down into the ditch of running water. On the spoke would be fastened an open box facing in this direction (indicating). As the box is filled it is lifted to the top here (indicating) and empties into a large box placed for that purpose, and from there pipes are run, down, forcing the water to that height. I saw a number of these in the streets of the capital of Idaho, the wheels varying in height from ten to eighteen feet.

At the point of location of the proposed big dam, they expect to build a town and to use this water power also for electric power to be applied to the running of cars on a road which they will build to the Union Pacific, furnishing an outlet in that way. It is also proposed to conduct power in this way to the silver mines situated something like thirty miles from there. The fuel question is a very serious one with them. They have no coal and are obliged to use wood, and if they can get the power from Snake river, it will be a source of great profit to the mining companies, who now have to pay four to eight dollars a cord for wood. They also propose to extend this electric road through the mines. The country is wild with schemes there, all promising immense profits and appearing very inviting. It is necessary for a person to keep

his head and to possess good sense and judgment, being sure of the solid character of a thing before venturing.

To give you an idea of the location of the mines, I will illustrate roughly on this chart. You will remember that the construction of the State of Idaho is something like this (indicating) and that Snake river is there. The railroad comes in and follows practically the valley of the Snake river, and about at this point (indicating) the little branch of the road of which I spoke runs. The mines are in this portion and Nampa there (indicating). It is about forty-eight miles from Nampa to the mines and all of the supplies must be hauled from there to the mines by teams, and those teams were a novelty to me. You pass teams there consisting of as high as eighteen heavy horses drawing three wagons coupled together like freight cars. They will pull all those wagons on a comparatively level road, and when they strike the mountain sides, they split up the procession and haul the wagons separately to the top. Then they hitch all together again and go on that way. The dust is something terrible. At the time I made the trip, we started at this point here (indicating) at night and crossed Snake river here where there is a ferry. By the way, if you go out there as a tenderfoot, you want to be prepared for many horrible tales. Our driver told us many before we started, and as we started at sundown and the drive was very lonesome, we expected to be held up any minute. I know I did,—but we were not molested,—they sized us up, I think.

At this point (indicating) there is a little cabin where a farmer lives and where we stayed over night. In the middle of the night I wanted to go fishing—the bugs were horrible—but I could not find a fishhook and stayed it out. The stream is as large as the Ohio, there is a very crude ferry and that is the only house, I believe, for a great number of miles around; at least, there are none in sight. From there we drove to Silver City mines. All of this way the ground was as bare as this floor. There was nothing at all to relieve you, and the dust was axle deep in places. We had four horses to a common surrey, and oftentimes the dust was so thick we could not see the lead horses. It was simply horrible. It took two days to go to Silver City, and there it was better.

The mining camps of Ohio are cities with city comforts compared with that country. As we neared Silver City, the first indications of a mineral country that attracted us was the condition of the streams. All along here in the streams it had the appearance of having been dug over, piled up and screened and picked again. For miles and miles along this stream, we could see evidences of where it had been worked. This was what is called

placer mining. About Silver City and down through here (indicating) there are exceptionally rich placer mines. There is where Stanford and other bonanza kings made their first large strikes. These placer mines have resulted from the washing down of the gold and silver from the mother lode or vein further up in the mountains. The gold and silver being heavier, as the water washed it down, it gradually settled at the bottom and the richest portion is found on the bed rock underlying the sand and gravel. In this particular locality, the vein ran across, like that, irregularly; and on this portion (indicating) there seemed to be a break in the formation. This portion here, they gave us the name as Trachite and this Porphory, while this portion was granite. The vein seemed to be cut through this Porphory to the granite. As usual when it strikes the solid granite, the vein ceased. The first discovery of gold is usually in the placer diggings. An adventurous man, with a small outlay for pan, shovel and pick, goes exploring through the country for the purpose of discovering gold, and tries in every conceivable spot, and becomes the pioneer in new territory. The pan is usually of sheet iron, like a milk pan, something like eighteen inches in diameter and probably five or six inches deep. He puts a shovel full of the gravel in the pan and fills it with water. He shakes it around and the clay and lighter portions fall over the top until he has left the coarse gravel. He examines each piece of gravel to see if it is a nugget of gold, and if not throws it away, until he finally gets down to pan gold.

Another method of working, is by the cradle. That is a modification of the last named method. It looks very much like an ordinary cradle for an infant. There is a hopper here (indicating on chart) with a perforated bottom, with holes a half inch or such a matter, and that sets up on an elevation. In here are riffles and this is mounted on rockers like a cradle. This would be about four inches high (indicating), while this is eighteen inches, or perhaps larger. The material is put in here and water dipped into it, and a rocking motion is kept up. Gradually the earthy matter settles down through this bottom which is perforated and runs down here and over here (indicating), over the riffles. In that way the clayey matter is thoroughly dissolved and flows over the top, and the valuable portion is caught here. Then this portion is panned out by a pan.

Another way is the "Long Tom," which is also a crude method. There is a large trough put at an elevation, and here is a hopper. This is wider at the bottom than at the top and has an iron bottom. The material is allowed to fall through the bottom at the sluice there. Another has an ordinary sluice. That is the

one that is generally used on a small or large scale in placer mining, the large one using hydraulic power, and the small one, ordinary man power. This is a trough (referring to illustration on chart) varying in width, with riffles through here. The gravel is shoveled through the top and a stream of water plays over it like this (indicating). In places they have a keg of mercury. It drops down here and being heavier follows these riffles and gathers up the metallic gold or silver and collects it in a vessel below. The amount of mercury used is judged by the miner by the amount of gold he is getting from a shovelfull of gravel.

The water used by means of the sluice and cradle is gotten by going up the stream and making a small dam and damming it to the proper level around the hills and conveying it down along the placer workings, and piping it down by square box or steel tubing to the point where they wish to use it.

Placer digging is all exhausted. It has gotten too poor for white men to work and the Chinamen are working it over again, using a small, cheap sluice, and nobody seems to know just how much they are making; but they are living and always have money.

The next development after the easy portion is exhausted, as we exhaust the easy coal, is the work of the veins. That necessitates large outlay of capital, as it requires special treatment, because it is necessary to do to the vein what the atmosphere and atmospheric agencies have done for it in depositing it in placer work. In this region the plan for treating the vein is by means of a stamp mill and outside concentration. The course that the material takes is, it is run through the stamps, then to the concentrates.

The concentrates are the refractory portion of the vein, and they are not treated at the same place, but are shipped to the smelters and sold by analysis.

Now, here are a few points that may be of some interest to any of you who may have any surveying or settling of claims to be made in this country. No one can make a survey unless he has a certificate from the surveyor general and there are a great number of conditions which they must comply with. Among other things, they cannot use a compass. The lines must be determined by the solar compass or deflected from established meridian objects from the stars. This is made necessary on account of local attractions and to get uniform notes of the survey. In this region the claim can be six hundred feet wide, in this direction (indicating), and one thousand five hundred feet in length, and the center, or apex of the vein is the dividing line. That is, the boundary goes as deep as you follow the vein vertically. In

this way (indicating) you have the lateral right of extension, you can follow the vein in any direction it goes. It may be right under half a dozen other veins beside you, but you have the right to follow the vein to the center of the earth, or past it, if you can follow it that far.

To locate a claim, if there is a government survey within two miles, it is necessary to connect with it. If not, you must establish your base or starting point and must take the corners in their order and number carefully in your notes, and at each corner you must plant a monument not less than four inches square and set in the ground not less than two feet, and extending above it not less than two feet, so as to permanently mark the corners of the claim clear around the tract. You must also take bearings on prominent mountain peaks, or rocks, or in some way fix it so the lines can be easily retraced. You must also notice any crossing with other lines, ravines, or any other peculiarities you may run across. If another man comes in and locates a claim like this, the date on which the claim was filed must be determined, and if your survey precedes his, then no interference on his part will be permitted. But if the other man's claim was filed first, then this notch comes out, and you must note in the survey the amount of infringement and amount unimpaired.

The claim is located lengthwise, as I said, of the vein. The center of the vein is the center of the claim. If that has not been determined, the discoverer's hole is considered the center. Oftentimes, the claim is not as intended, lengthwise, but is located like this (indicating), crosswise. In cases like that, then the side lines become the ends of the claim and the lateral extension comes in this direction. That has been settled by lawsuits and there is no doubt about it. But cases not settled come in like this (indicating drawing on chart). Suppose the claim runs in that manner—that is, that it enters an end line and comes out at the side lines: then what right has the man who located this? That point has never been settled, and it is one of the points which is difficult to settle. There is a case on record in which the claim was located something like this (illustrating). This claim was first located and another man came in and aimed to get what was left. Knowing this, the company opened up on what they supposed to be the apex of the vein. Subsequent developments showed they had been working on a slip and that the real apex before the slide was through here (indicating). A lawsuit was the result, and the courts gave this man lateral extension, cutting this man (indicating) out.

The surveying of gold mines is very similar, and done with

nearly as great care as the surveying of coal mines, except they do not work the entire vein. The vein is not equal in all its parts in richness, there being what are known as ore chutes. They drive what coal miners would call a heading in the vein and drive along until they come to a rich portion of the ore, or ore chute, and there would be what the coal miners would call a room, or stop; and that is timbered, with an opening resembling very much the chute for discharging lump coal from a mine, with a door opening at will, and from here they load into the cars. In times these chutes connect with each other and the vein is worked in that manner. The survey is principally of these tunnels, and there is no regular distance between them. That is governed by circumstances.

The gauge of track is small there, eighteen inches. The mine car is made of iron and so arranged as to dump on all sides, and is very similar to the dump car used in discharging the slack onto the slack piles, only it is on a much smaller scale and is pushed out by a man. I did not see a mule in any of the mines there. The plan is to make everything automatic and everything as cheap as possible and deliver the ore as high as possible. The stamps are in batteries of five, and above the stamps is the bin.

The ore from the car comes out in all sizes from one hundred pounds to pieces in dust, and is run over what we call a screen about an inch and a quarter in mesh. What goes over there is run off into another bin which feeds into a crusher. What drops through is fed by an automatic feeder into the stamps. The rocks crushed by the crusher also drop into this same bin and is fed on into the stamps. The bin is arranged so as to hold a night's run of mineral. The stamps are on this level (indicating) and down below that the true vanners; and below them are the settling boxes, perhaps the size of that table (indicating), and about eighteen inches in depth. The amalgamating pans are on this level down here, and here are the settlers, and down here the assay room and engine room.

I have some samples here illustrating the different stages of the processes gone through.

(Here the speaker exhibits samples of ore in the various stages of mining process, and describes at length the conditions each has undergone.)

PRESIDENT ORTON: Professor Ray has given us an interesting description of phases of mining with which many of us are not familiar. I am acquainted with mining in many different phases, but have not as yet seen the mining of gold and silver.

MR. KANE: I presume the paper is open to discussion now, —not the paper, but the lecture. I generally make it a point to try to find the weak places in a discourse; but I think Professor Ray has stolen a march on us, for I cannot contradict anything, cannot question anything—I would if I could. While we are more especially interested in coal mining, and are not familiar with the subject of the lecture, yet Professor Ray has presented to us a very meritorious and interesting discourse, for which I move a vote of thanks be given to him.

(Seconded by Mr. Jones. Carried.)

On motion meeting adjourned.

AFTERNOON SESSION.

January 23, 1:30 o'clock.

Election of officers was postponed until later in the afternoon, and Captain Morris not having arrived at the time of opening the session, the following letter from Mr. Frederick C. Keighley, Uniontown, Pa., was read by Mr. Haseltine, and was followed by the reading of Mr. Keighley's paper by Mr. Llewellyn.

"Oliver, Fayette County, Pa., Jan. 20, 1896.

"Hon. R. M. Haseltine, Chief Inspector of Mines, Columbus, Ohio:

"Dear Friend:—I have this morning mailed to you by special delivery my paper,—'Theoretical and Practical Mine Ventilation.'

"As I cannot get down, I would like to be informed on the criticisms of the Institute. You can say to them that I want and ask no quarter, and because I am not there I do not want them to feel that it would be unfair to handle it roughly. I did not write the paper for the paper's sake, but to bring out some points that sadly need bringing out. If anyone there wants to attack the position taken, they are welcome, for that is exactly what is wanted and the real function of the paper, and the stronger the attack the more general good it will accomplish.

"You can say to them that I feel it an honor to be allowed to present the paper and only wish I could be there, but my work will not allow it at this time.

"I regret above all things that I cannot hear the Coke paper, for I am satisfied it would be of great value to me.

"Trusting that you will all have a happy and profitable time, I remain,

"Very truly yours,

"FRED C. KEIGHLEY."

E. D. HASELTINE.